

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**  
**REQUEST FOR FILING NATIONAL PHASE OF**  
**PCT APPLICATION UNDER 35 U.S.C. 371 AND 37 CFR 1.494 OR 1.495**

To: Hon. Commissioner of Patents  
 Washington, D.C. 20231



00909

TRANSMITTAL LETTER TO THE UNITED STATES  
 DESIGNATED/ELECTED OFFICE (DO/EO/US)

Atty Dkt: P 290586 /SET9902PCT/US  
 M# /Client Ref.

From: Pillsbury Winthrop LLP, IP Group:

Date: February 21, 2002

This is a **REQUEST** for **FILING** a PCT/USA National Phase Application based on:

1. International Application	2. International Filing Date	3. Earliest Priority Date Claimed
<u>PCT/EP00/07381</u>	<u>31 July 2000</u>	<u>21 August 1999</u>
<u>↑ country code</u>	Day MONTH Year	Day MONTH Year (use item 2 if no earlier priority)

4. Measured from the earliest priority date in item 3, this PCT/USA National Phase Application Request is being filed within:

(a) ☐ 20 months from above item 3 date (b) ☒ 30 months from above item 3 date,

(c) Therefore, the due date (unextendable) is February 21, 2002

5. Title of Invention HOT-MELT RESINS AND THEIR USE

6. Inventor(s) Rainer BLUM  
 Manfred EICHORST  
 Günther HEGEMANN  
 Klaus-Wilhelm LIENERT

Applicant herewith submits the following under 35 U.S.C. 371 to effect filing:

7. ☒ Please immediately start national examination procedures (35 U.S.C. 371 (f)).

8. ☐ A copy of the International Application as filed (35 U.S.C. 371(c)(2)) is transmitted herewith (file if in English but, if in foreign language, file only if not transmitted to PTO by the International Bureau) including:

- a. ☐ Request;  
 b. ☐ Abstract;  
 c.     pgs. Spec. and Claims;  
 d.     sheet(s) Drawing which are ☐ informal ☐ formal of size ☐ A4 ☐ 11"

9. ☒ A copy of the International Application has been transmitted by the International Bureau.

10. A translation of the International Application into English (35 U.S.C. 371(c)(2))

- a. ☒ is transmitted herewith including: (1) ☐ Request; (2) ☒ Abstract;  
 (3) 30 pgs. Spec. and Claims;  
 (4)     sheet(s) Drawing which are:  
☐ informal ☐ formal of size ☐ A4 ☐ 11"
- b. ☐ is not required, as the application was filed in English.  
 c. ☐ is not herewith, but will be filed when required by the forthcoming PTO Missing Requirements Notice per Rule 494(c) if box 4(a) is X'd or Rule 495(c) if box 4(b) is X'd.  
 d. ☐ Translation verification attached (not required now).

11. ☒ Please see the attached Preliminary Amendment
12. ☐ Amendments to the claims of the International Application **under PCT Article 19 (35 U.S.C. 371(c)(3)), i.e., before 18th month from first priority date above in item 3, are transmitted herewith (file only if in English) including:**
13. ☒ PCT Article 19 claim amendments (if any) have been transmitted by the International Bureau
14. ☐ Translation of the amendments to the claims **under PCT Article 19 (35 U.S.C. 371(c)(3)), i.e., of claim amendments made before 18th month, is attached (required by 20th month from the date in item 3 if box 4(a) above is X'd, or 30th month if box 4(b) is X'd, or else amendments will be considered canceled).**
15. **A declaration of the inventor (35 U.S.C. 371(c)(4))**  
a. ☐ is submitted herewith ☐ Original ☐ Facsimile/Copy  
b. ☒ is not herewith, but will be filed when required by the forthcoming PTO Missing Requirements Notice per Rule 494(c) if box 4(a) is X'd or Rule 495(c) if box 4(b) is X'd.
16. **An International Search Report (ISR):**  
a. Was prepared by ☒ European Patent Office ☐ Japanese Patent Office ☐ Other  
b. ☒ has been transmitted by the international Bureau to PTO.  
c. ☐ copy herewith (\_\_\_ pg(s).) ☐ plus Annex of family members (\_\_\_ pg(s).).
17. **International Preliminary Examination Report (IPER):**  
a. ☒ has been transmitted (if this letter is filed after 28 months from date in item 3) in English by the International Bureau with Annexes (if any) in original language.  
b. ☐ copy herewith in English.  
c.1 ☐ IPER Annex(es) in original language ("Annexes" are amendments made to claims/spec/drawings during Examination) including attached amended:  
c.2 ☐ Specification/claim pages #\_\_\_ claims #  
Dwg Sheets #  
d. ☐ Translation of Annex(es) to IPER **(required by 30<sup>th</sup> month due date, or else annexed amendments will be considered canceled).**
18. **Information Disclosure Statement including:**  
a. ☒ Attached Form PTO-1449 listing documents  
b. ☒ Attached copies of documents listed on Form PTO-1449  
c. ☒ A concise explanation of relevance of ISR references is given in the ISR.
19. ☐ **Assignment** document and Cover Sheet for recording are attached. Please mail the recorded assignment document back to the person whose signature, name and address appear at the end of this letter.
20. ☐ Copy of Power to IA agent.
21. ☐ **Drawings** (complete only if 8d or 10a(4) not completed): \_\_\_ sheet(s) per set: ☐ 1 set informal; ☐ Formal of size ☐ A4 ☐ 11"
22. Small Entity Status ☒ is **Not** claimed ☐ is claimed (**pre-filing confirmation required**)  
22(a) \_\_\_ (No.) Small Entity Statement(s) enclosed (since 9/8/00 Small Entity Statements(s) not essential to make claim)
23. **Priority** is hereby claimed under 35 U.S.C. 119/365 based on the priority claim and the certified copy, both filed in the International Application during the international stage based on the filing in (country) Germany of:
- |     | Application No. | Filing Date     |     | Application No. | Filing Date |
|-----|-----------------|-----------------|-----|-----------------|-------------|
| (1) | 19939759.7      | August 21, 1999 | (2) |                 |             |
| (3) |                 |                 | (4) |                 |             |
| (5) |                 |                 | (6) |                 |             |
- a. ☒ See Form PCT/IB/304 sent to US/DO with copy of priority documents. If copy has not been received, please proceed promptly to obtain same from the IB.
- b. ☐ Copy of Form PCT/IB/304 attached.

RE: USA National Phase Filing of PCT/EP00/07381

JC13 Rec'd PCT/PTO 21 FEB 2002

24. Attached:

25 Per Item 17.c2, cancel original pages #\_\_, claims #\_\_, Drawing Sheets #

26. **Calculation of the U.S. National Fee (35 U.S.C. 371 (c)(1)) and other fees is as follows:**

Based on amended claim(s) per above item(s) ☐ 12, ☐ 14, ☐ 17, ☐ 25 (hilite)

Total Effective Claims	23	minus 20 =	3	x \$18/\$9	=	\$54	966/967
Independent Claims	2	minus 3 =	0	x \$84/\$42	=	\$0	964/965
If any proper (ignore improper) Multiple Dependent claim is present,				add \$280/\$140	+	0	968/969

BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(4)): →→ **BASIC FEE REQUIRED, NOW** →→→→

A. If country code letters in item 1 are not "US", "BR", "BB", "TT", "MX", "IL", "NZ", "IN" or "ZA"

See item 16 re:

1. Search Report was <u>not</u> prepared by EPO or JPO -----	add \$1,040/\$52	0		960/961
2. Search Report was prepared by EPO or JPO -----	add \$890/\$445	+890		970/971

**SKIP B, C, D AND E UNLESS country code letters in item 1 are "US", "BR", "BB", "TT", "MX", "IL", "NZ", "IN", "ZA", "LC" or "PH"**

→ <input type="checkbox"/> B. If <u>USPTO</u> did not issue both International Search Report (ISR) and (if box 4(b) above is X'd) the International Examination Report (IPER), -----	add \$1,040/\$52	+0	960/961
(only) <input type="checkbox"/> C. If <u>USPTO</u> issued ISR but not IPER (or box 4(a) above is X'd), -----	add \$740/\$370	+0	958/959
(these) <input type="checkbox"/> D. If <u>USPTO</u> issued IPER but IPER Sec. V boxes <u>not</u> all 3 YES, -----	add \$710/\$355	+0	956/957
(4) → <input type="checkbox"/> E. If international preliminary examination fee was paid to <u>USPTO</u> and Rules 492(a)(4) and 496(b) <u>satisfied</u> (in IPER Sec. V <u>all</u> 3 boxes <u>must</u> be YES for <u>all</u> claims), --	add \$100/\$50	+0	962/963

**SUBTOTAL = \$944**

27. If Assignment box 19 above is X'd, add Assignment Recording fee of ----\$40 +0 (581)

28. If box 15a is X'd, determine whether inventorship on Declaration is different than in international stage. If yes, add (per Rule 497(d)) ----\$130 +0 (098)

29. Attached is a check to cover the ----- **TOTAL FEES \$944**

Our Deposit Account No. 03-3975

Our Order No. 07376 | 290586  
C# M#



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**CHARGE STATEMENT:** The Commissioner is hereby authorized to charge any fee specifically authorized hereafter, or any missing or insufficient fee(s) filed, or asserted to be filed, or which should have been filed herewith or concerning any paper filed hereafter, and which may be required under Rules 16-18 and 492 (missing or insufficient fee only) now or hereafter relative to this application and the resulting Official document under Rule 20, or credit any overpayment, to our Account/Order Nos. shown above for which purpose a duplicate copy of this sheet is attached.

This CHARGE STATEMENT does not authorize charge of the issue fee until/unless an issue fee transmittal form is filed

**Pillsbury Winthrop LLP  
Intellectual Property Group**

By Atty: Adam R. Hess

Reg. No. 41835

Sig: Carlo Coltrone 48,715

Fax: (703) 905-2500  
Tel: (703) 905-2089

Atty/Sec: ARH/WDW:cdw

**NOTE:** File in duplicate with 2 postcard receipts (PAT-103) & attachments.

# APPLICATION UNDER UNITED STATES PATENT LAWS

Atty. Dkt. No. PW 290586  
(M#)

Invention: HOT-MELT RESINS AND THEIR USE

Inventor (s): Rainer BLUM  
Manfred EICHORST  
Günther HEGEMANN  
Klaus-Wilhelm LIENERT



00909

Pillsbury Winthrop LLP

This is a:

- ☐ Provisional Application
- ☐ Regular Utility Application
- ☐ Continuing Application
  - ☒ The contents of the parent are incorporated by reference
- ☒ PCT National Phase Application
- ☐ Design Application
- ☐ Reissue Application
- ☐ Plant Application
- ☐ Substitute Specification
  - Sub. Spec Filed \_\_\_\_\_
  - in App. No. \_\_\_\_\_ / \_\_\_\_\_
- ☐ Marked up Specification re
  - Sub. Spec. filed \_\_\_\_\_
  - In App. No. \_\_\_\_\_ / \_\_\_\_\_

## SPECIFICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re PATENT APPLICATION of:

BLUM et al.

Group Art Unit: TBA

Application No.: TBA

Examiner: TBA

Filed: February 21, 2002

FOR: HOT-MELT RESINS AND THEIR USE

\* \* \* \* \*

February 21, 2002

PRELIMINARY AMENDMENT

Hon. Commissioner of Patents  
Washington, D.C. 20231

Sir:

Prior to examination on the merits, please amend the above-identified patent in the manner set forth below.

IN THE SPECIFICATION:

At the top of the first page, just under the title, insert

--This application is the National Phase of International Application PCT/EP00/07381 filed July 31, 2000, which designated the U.S. The PCT application is hereby incorporated in its entirety by reference. --

IN THE CLAIMS:

Please amend the claims as follows:

1. (Amended) Hot-melt resins comprising
  - A) at least one solid unsaturated polyester and

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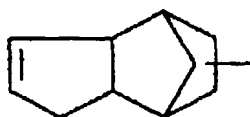
B) at least one oligomeric and/or polymeric crosslinking agent which is copolymerizable with the said polyester and which in respect of the oligomeric and/or polymeric main chain comprises at least one terminal and/or pendant propenyl, isopropenyl and/or (meth)acrylic ester group.

2. (Amended) The hot-melt resins as claimed in claim 1, wherein the crosslinking agents (B) have at least two terminal and/or pendant propenyl, isopropenyl and/or (meth) acrylic ester groups.

3. (Amended) The hot-melt resins as claimed in claim 1, wherein the crosslinking agents (B) have propenyl and/or isopropenyl groups.

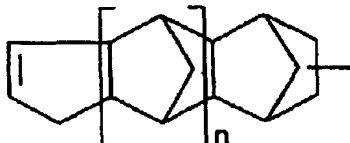
4. (Amended) The hot-melt resins as claimed in claim 1, wherein the oligomer and polymer main chains are formed by saturated and/or unsaturated polyesters, polyester amides, polyester amides and/or polyurethanes.

5. (Amended) The hot-melt resins as claimed in claim 1, wherein at least one of the unsaturated polyesters (A) and/or at least one of the crosslinking agents (B) has at least one structural unit of the general formula I



**(I)**

and/or at least one structural unit of the general formula II



**(II)** in which the index n is an integer from 1 to 10.

6. (Amended) The hot-melt resins as claimed in claim 1, wherein they comprise

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additives, especially curing accelerators, photoinitiators, especially of Norrish type 1 or 2, pigments and/or fillers.

7. (Amended)           The hot-melt resins as claimed in claim 6, wherein the photoinitiators are bonded chemically to at least one of the unsaturated polyesters (A) and/or at least one of the crosslinking agents (B) .

8. (Amended)           The use of the hot-melt resins as claimed in claim 1 as casting and impregnating compositions or coating materials.

9. (Amended)           The use of the hot-melt resins as claimed in claim 8, wherein they are used as casting and impregnating compositions for components and for impregnating absorbent materials and also as coating materials for primed and unprimed substrates.

10. (Amended)          The use of the hot-melt resins as claimed in claim 9, wherein the components comprise electronic components, the absorbent materials comprise sheetlike insulating materials, especially glass silk and mica tapes, and the primed and unprimed substrates comprise vehicle body parts, industrial components or packaging, especially of metal and/or plastic.

11. (Amended)          A process for the melt impregnation or melt coating of components, absorbent materials or primed and unprimed substrates comprising

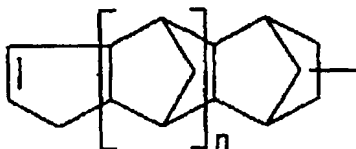
- (i)           melt-applying a hot-melt resin,
- (ii)          applying the resultant resin melt onto and into the components, absorbent materials or primed or unprimed substrates,
- (iii)         curing the applied resin melt by heat and/or actinic radiation,

wherein the hot-melt resin comprises





and/or at least one structural unit of the general formula II



(II) in which the index n is an integer from 1 to 10.

16. (Amended) The process as claimed in claim 11, wherein they comprise additives, especially curing accelerators, photoinitiators, especially of Norrish type 1 or 2, pigments and/or fillers.

17. (Amended) The process as claimed in claim 16, wherein the photoinitiators are bonded chemically to at least one of the unsaturated polyesters (A) and/or at least one of the crosslinking agents (B).

18. (Amended) The process as claimed in claim 11, wherein the application (ii) takes place by

placing at least one shaped part comprising the hot-melt resin and adapted in its shape to the shape of the component, absorbent material or primed and unprimed substrate to be coated onto the component, absorbent material or primed and unprimed substrate, and melting the shaped part,

or by

dipping, hot-dipping, dip-rolling, flooding, casting, vacuum impregnation, vacuum pressure impregnation or trickling.

19. (Amended) The process as claimed in claim 11, wherein the applied hot-melt resin is partially gelled (process step iv) before process step (iii).

20. (Amended) The process as claimed in claim 11, wherein the applied hot-melt resin



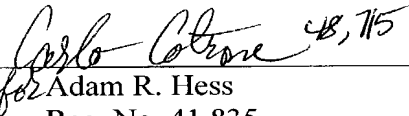
**BLUM – Filed February 21, 2002**

REMARKS

After introduction of the amendment set forth above, claims 1-23 will be pending in the application of which claims 1 and 11 are independent. Claims 1-23 have been amended, inter alia, to eliminate multiple dependency of the claims. Support for the above amendments can be found throughout the original application as filed. Applicants submit that no new matter has been introduced by the amendment.

Respectfully submitted,

PILLSBURY WINTHROP, LLP

By:   
for Adam R. Hess  
Reg. No. 41,835  
Tel. No.: (703) 905-2089  
Fax No.: (703) 905-2500

ARH/WDW:cdw  
1600 Tysons Boulevard  
McLean, VA 22102  
(703) 905-2000

Enclosure: Appendix

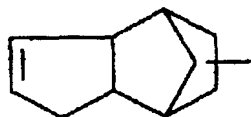
APPENDIX

VERSION WITH MARKINGS SHOWING CHANGES MADE

IN THE CLAIMS:

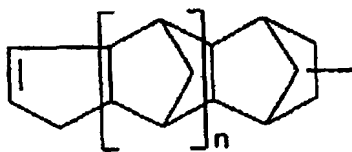
The claims are amended as follows:

1. (Amended) Hot-melt resins comprising
  - A) at least one solid unsaturated polyester and
  - B) at least one oligomeric and/or polymeric crosslinking agent which is copolymerizable with the said polyester and which in respect of the oligomeric and/or polymeric main chain comprises at least one terminal and/or pendant propenyl, isopropenyl and/or (meth)acrylic ester group.
2. (Amended) The hot-melt resins as claimed in claim 1, [characterized in that] wherein the crosslinking agents (B) have at least two terminal and/or pendant propenyl, isopropenyl and/or (meth) acrylic ester groups.
3. (Amended) The hot-melt resins as claimed in claim 1 [or 2], [characterized in that] wherein the crosslinking agents (B) have propenyl and/or isopropenyl groups.
4. (Amended) The hot-melt resins as claimed in [one of claims 1 to 3] claim 1, [characterized in that] wherein the oligomer and polymer main chains are formed by saturated and/or unsaturated polyesters, polyester amides, polyester amides and/or polyurethanes.
5. (Amended) The hot-melt resins as claimed in [one of claims 1 to 4] claim 1, [characterized in that] wherein at least one of the unsaturated polyesters (A) and/or at least one of the crosslinking agents (B) has at least one structural unit of the general formula I



(I)

and/or at least one structural unit of the general formula II



(II) in which the index n is an integer from 1 to 10.

6. (Amended) The hot-melt resins as claimed in [one of claims 1 to 5] claim 1, [characterized in that] wherein they comprise additives, especially curing accelerators, photoinitiators, especially of Norrish type 1 or 2, pigments and/or fillers.

7. (Amended) The hot-melt resins as claimed in claim 6, [characterized in that] wherein the photoinitiators are bonded chemically to at least one of the unsaturated polyesters (A) and/or at least one of the crosslinking agents (B) .

8. (Amended) The use of the hot-melt resins as claimed in [one of claims 1 to 7] claim 1 as casting and impregnating compositions or coating materials.

9. (Amended) The use of the hot-melt resins as claimed in claim 8, [characterized in that] wherein they are used as casting and impregnating compositions for components and for impregnating absorbent materials and also as coating materials for primed and unprimed substrates.

10. (Amended) The use of the hot-melt resins as claimed in claim 9, [characterized in that] wherein the components comprise electronic components, the absorbent materials comprise sheetlike insulating materials, especially glass silk and mica tapes, and the primed

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and unprimed substrates comprise vehicle body parts, industrial components or packaging, especially of metal and/or plastic.

11. (Amended) A process for the melt impregnation or melt coating of components, absorbent materials or primed and unprimed substrates [by] comprising

- (i) melt-applying a hot-melt resin,
- (ii) applying the resultant resin melt onto and into the components, absorbent materials or primed or unprimed substrates,
- (iii) curing the applied resin melt by heat and/or actinic radiation,

[characterized in that] wherein the hot-melt resin comprises

A) at least one solid unsaturated polyester and

B) at least one oligomeric and/or polymeric crosslinking agent which is copolymerizable with the said polyester and which in respect of the oligomeric and/or polymeric main chain comprises at least one terminal and/or pendant propenyl, isopropenyl and/or (meth)acrylic ester group.

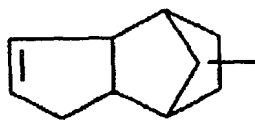
12. (Amended) The process as claimed in claim 12, [characterized in that] wherein the crosslinking agents (B) have at least two terminal and/or pendant propenyl, isopropenyl and/or (meth)acrylic ester groups.

13. (Amended) The process as claimed in claim 11 [or 12], [characterized in that] wherein the crosslinking agents (B) have propenyl and/or isopropenyl groups.

14. (Amended) The process as claimed in [one of claims 11 to 13] claim 11, [characterized in that] wherein the oligomer and polymer main chains are formed by linear,

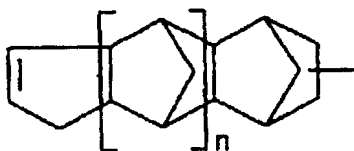
branched and/or dendrimeric, saturated and/or unsaturated polyesters, polyester amides, polyester amides and/or polyurethanes.

15. (Amended) The process as claimed in [one of claims 11 to 14] claim 11, [characterized in that] wherein at least one of the unsaturated polyesters (A) and/or at least one of the crosslinking agents (B) has at least one structural unit of the general formula I



(I)

and/or at least one structural unit of the general formula II



(II) in which the index n is an integer from 1 to 10.

16. (Amended) The process as claimed in [one of claims 11 to 15] claim 11, [characterized in that] wherein they comprise additives, especially curing accelerators, photoinitiators, especially of Norrish type 1 or 2, pigments and/or fillers.

17. (Amended) The process as claimed in claim 16, [characterized in that] wherein the photoinitiators are bonded chemically to at least one of the unsaturated polyesters (A) and/or at least one of the crosslinking agents (B).

18. (Amended) The process as claimed in [one of claims 11 to 17] claim 11, [characterized in that] wherein the application (ii) takes place by

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placing at least one shaped part comprising the hot-melt resin and adapted in its shape to the shape of the component, absorbent material or primed and unprimed substrate to be coated onto the component, absorbent material or primed and unprimed substrate, and melting the shaped part,

or by

dipping, hot-dipping, dip-rolling, flooding, casting, vacuum impregnation, vacuum pressure impregnation or trickling.

19. (Amended) The process as claimed in [one of claims 11 to 18] claim 11, [characterized in that] wherein the applied hot-melt resin is partially gelled (process step iv) before process step (iii).

20. (Amended) The process as claimed in [one of claims 11 to 19] claim 11, [characterized in that] wherein the applied hot-melt resin in process step (iii) is cured by thermal curing by means of electricity, induction, hot fluids, especially hot gases, microwave radiation and/or IR radiation, especially near infrared (NIR) radiation.

21. (Amended) The process as claimed in [one of claims 11 to 20] claim 11, [characterized in that] wherein the applied hot-melt resin in process step (iii) is cured electromagnetic radiation, especially UV radiation, and/or corpuscular radiation, especially electron beams.

22. (Amended) Components, especially electrical components, sheetlike insulating materials based on absorbent materials, and primed and unprimed substrates comprising at least one hot-melt resin, cured thermally and/or with actinic radiation, as claimed in [one of claims 1 to 10] claim 1.

23. (Amended) The components, especially the electronic components, the sheetlike insulating materials based on absorbent materials and the primed and unprimed substrates as claimed in claim 22, [characterized in that] wherein the hot-melt resins have been applied and cured with the aid of the process as claimed in one of claims 11 to 21.



Hot-melt resins and their use

The invention relates to hot-melt resins based on unsaturated polyesters and to the use of these hot-melt resins as casting and impregnating compositions or coating materials.

Casting and impregnating compositions are hot-melt resins which are employed in particular in electrical engineering in accordance with techniques which are general knowledge, such as dipping, hot-dipping, dip-rolling, flooding, casting, vacuum impregnation, vacuum pressure impregnation or trickling for impregnating windings of electronic components.

The hot-melt resins are also suitable for impregnating absorbent materials such as carrier materials for sheetlike insulating materials, especially glass silk or mica tapes. In such applications, curing may be interrupted at the B stage, to give curable prepregs.

Moreover, the hot-melt resins may be used as coating materials for primed or unprimed substrates such as vehicle body parts, industrial components or packaging, especially metal and/or plastics substrates.

Not least, the hot-melt resins may be used to produce an abrasion protection for high-speed machine parts.

Mainly, however, the hot-melt resins are used as casting and impregnating compositions for electrical and electronic components.

The majority of known casting and impregnating compositions for electrical components such as motor windings or transformer windings are liquid formulations based on unsaturated polyesters, which are in solution in compounds containing vinylic and/or allylic unsaturation, such as styrene, (alpha-methylstyrene, vinyltoluene, allyl phthalates and monomeric or oligomeric acrylic or vinyl esters. Also known, furthermore, are liquid compositions based on

- 2 -

dicyclopentadienyl (DCPD)-modified unsaturated polyester resins, which can be cured without additional liquid and/or solid comonomers.

5 A disadvantage of these known casting and  
impregnating compositions is the use of the  
abovementioned monomers, which are vital for  
establishing the required, relatively low processing  
viscosities and for the curing of the unsaturated  
polyester resins. These monomers are injurious to  
10 health and irritant to skin. In the case of known  
applications of casting and impregnating compositions  
comprising these substances, moreover, there are mass  
losses of from 20 to 30%. These considerable amounts  
must be removed from the workplace in order to avoid  
15 health hazards for the employees. The evaporated  
amounts, drawn off under suction, are generally  
disposed of in waste-air incinerators. This gives rise  
to unwanted emissions. Moreover, the incineration of  
such quantities of material is uneconomic. Furthermore,  
20 there is a risk of these monomers not being  
incorporated completely in the course of curing.  
Residual monomers in the cured compositions may emerge,  
especially from electrical insulating compositions,  
which tend to become warm during use, and may lead to  
25 odor nuisance and health hazards. They may also  
gradually aftercure within the molding compounds, so  
undesirably altering the service properties of the said  
compounds.

A considerable technical problem with all  
30 liquid casting and impregnating compositions, including  
those curable without monomers, is the deficient  
storage stability of the formulations made ready for  
use by the addition of catalysts. In transit,  
especially at summer temperatures, there is always the  
35 risk of unwanted premature reactions, ranging from  
partial gelling to complete reaction, which is  
dangerous.

For these reasons, there have already been a number of attempts to use solid resins as casting and impregnating compositions. Using such hot-melt resins, it ought to be possible to reduce markedly the emissions and to improve the storage stability.

European Patent EP-A-0 101 585 proposes casting and impregnating compositions of high thermal stability and heat distortion resistance which comprise unsaturated polyesters modified with dicyclopentadiene and/or other 1,3-diolefins and as their alcohol component comprise N-hydroxyalkylimides of mono-unsaturated, unsubstituted or substituted, cycloaliphatic 1,2-dicarboxylic acids. The resins are processed as solutions in styrene, for example.

European Patent EP-A-0 118 786 discloses casting and impregnating compositions comprising unsaturated polyester resins which may have been modified with dicyclopentadiene, which contain cyclopentene or cyclohexene groups, and which are prepared in a complex process conducted preferably in two stages. Curing is effected at temperatures above 200°C in the presence of free-radical initiators which decompose above 140°C, or by irradiation with electron beams. The casting and impregnating compositions are processed as solutions in styrene, for example.

European Patent EP-A-0 260 688 avoids the disadvantages of the high curing temperatures of EP-A-0 118 786, of more than 200°C, by means of a modified two-stage process in which the high temperatures of the aftercure in the second stage are reduced to 120 - 200°C through the use of a specific selection of free-radical initiators.

Japanese laid-open specification JP-A-53 05 97 91 describes polyesterimide resins which are prepared using at least tribasic carboxylic acids, polyester polyols and amines. These substances are used as thermoplastic hot-melt resins for electrical insulation.





components, absorbent materials or primed and unprimed substrates by

- 5 (i) melt-applying a hot-melt resin,
- (ii) applying the resultant resin melt onto and into the components, absorbent materials or primed or unprimed substrates,
- 10 (iii) curing the applied resin melt by heat and/or actinic radiation,

which is characterized in that the hot-melt resin used comprises the hot-melt resin of the invention.

15           In the text below, the novel process for the  
melt impregnation or melt coating of components,  
absorbent materials or primed and unprimed substrates  
is referred to for short as "process of the invention".

20 Last but not least, we have found novel components, especially electrical components, sheetlike insulating materials based on absorbent materials, and primed and unprimed substrates, all of which comprise at least one hot-melt resin of the invention cured thermally and/or with actinic radiation.

25           In the text below, these articles are referred to respectively as "components of the invention", "insulating materials of the invention", "substrates of the invention" or, collectively, as "articles of the invention".

30 In the light of the prior art it was surprising  
and unforeseeable for the person skilled in the art that  
the complex problem on which the present invention is  
based might be solved with the aid of the hot-melt  
resins of the invention. Surprisingly, the hot-melt  
35 resins of the invention melt at relatively low  
temperatures and have a low melt viscosity, so that a  
formulation in the melt with free-radical initiators  
and further auxiliaries can be accomplished rapidly and







In accordance with the invention, particular advantages result from using these oligomeric  
35 crystalline or partially crystalline crosslinking agents (B) in combination with highly condensed, solid, unsaturated polyesters (A). Such combinations display the desired melting characteristics (low melting

- 10 -

temperature, low melt viscosity at temperatures in the vicinity of the melting temperature, i.e., a steep course of the curve of viscosity over temperature), a good melt stability even in the presence of catalysts and, after curing, produce particularly heat-stable impregnations and coatings.

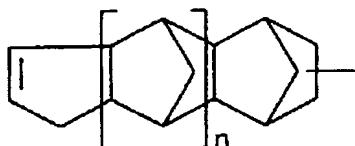
In accordance with the invention, however, it is also of advantage to combine unsaturated polyesters (A) which have lower degrees of condensation and/or have been prepared using monofunctional substances with polymeric crosslinking agents (B).

A further key advantage of the hot-melt resins of the invention is that the weight ratio of polyester (A) to crosslinking agent (B) may be varied very widely, so giving hot-melt resins of the invention with a very wide variety of profiles of properties. By this means it is possible to tailor the hot-melt resins of the invention simply and advantageously to a very wide variety of end uses. Advantageously, the weight ratio (A):(B) is from 5:1 to 1:5, with particular preference from 4:1 to 1:3, with very particular preference from 3:1 to 1:1.5, and in particular from 2.5:1 to 1:1.2. Accordingly, the amount of crosslinking agents (B) for use in accordance with the invention in the hot-melt resins of the invention may vary very widely. In accordance with the invention it is of advantage if the crosslinking agents (B) are present in the hot-melt resins of the invention in an amount, based in each case on the hot-melt resins, of from 2 to 60% by weight, preferably from 3 to 55% by weight, with particular preference from 5 to 50% by weight, and in particular from 7 to 45% by weight.

The other essential constituents of the hot-melt resins of the invention are the solid unsaturated polyesters (A).

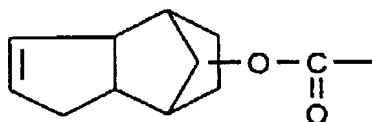
Examples of suitable polyesters (A) for use in accordance with the invention are polyesters which are known per se and which have structural units of the

(I)



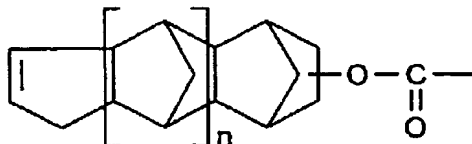
5

Preferably, these groups are introduced by way  
10 of the readily obtainable esterlike DCPD adducts, in  
accordance with the formulae III and IV, with  
polycarboxylic acids:



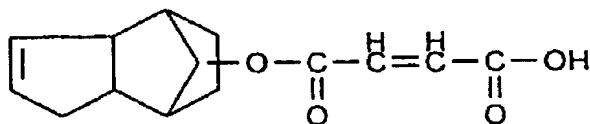
(III)

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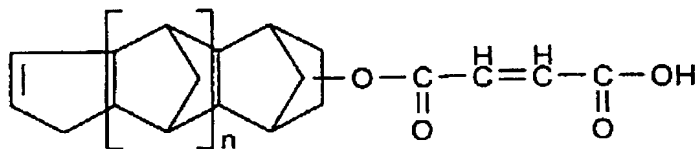


20           The adducts of maleic anhydride and water with  
DCDP, in accordance with the formulae V and VI, are  
very readily obtainable:

- 12 -

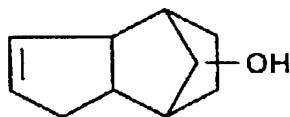


(V)



(VI).

Moreover, dihydrodicyclopentadienol of formula VII is available commercially and may also be used when synthesizing the unsaturated polyesters. Doing so likewise introduces the structures of the formulae I and II and produces unsaturated polyesters (A).



(VII)

The synthesis of the polyesters (A) for use in accordance with the invention takes place by the prior art processes for preparing polyesters, generally by polycondensation of polyfunctional hydroxyl compounds with polyfunctional acids and/or their anhydrides at relatively high temperatures. It may be advantageous to start from the esters of such compounds and to obtain the polyesters (A) by transesterification at relatively high temperatures, since such transesterifications in some cases proceed more readily and more rapidly than direct esterification. The unsaturated nature of the polyesters (A) comes about through the use of

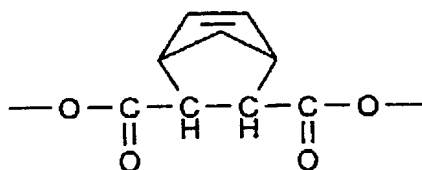
unsaturated compounds in the acid component and/or unsaturated alcohol component, such as, for example, alkenediols and/or alkoxyated alkenediols. Preferably, unsaturated polyester resins (A) are obtained with maleic acid and/or maleic anhydride and/or fumaric acid. These compounds are available industrially at very favorable cost. Moreover, it is also possible, by using polyfunctional amines, to obtain polyesters (A) having amide structures. The use of monofunctional starting materials is also possible in order, for example, to regulate the molecular weight.

Examples of suitable compounds for the synthesis of the unsaturated polyesters (A) are adipic acid, suberic acid, phthalic acid isomers, tetrahydrophthalic acid, endomethylenetetrahydrophthalic acid, hexahydrophthalic acid, fumaric acid, maleic acid, itaconic acid, citraconic acid, trimellitic acid, pyromellitic acid, ethylene glycol, polyethylene glycols, propylene glycol, polypropylene glycols, butanediol isomers, hexanediol, neopentyl glycol, trimethylolpropane, glycerol, pentaerythritol, bisphenol A, tris-hydroxyethyl isocyanurate (THEIC), OH-polyfunctional polymers, such as hydroxyl-modified polybutadienes or hydroxyl-bearing polyurethane prepolymers and epoxy resins, polyfunctional natural substances or their derivatives, such as linseed oil fatty acid, dimeric and polymeric linseed oil fatty acid, castor oil, and castor oil fatty acid. Hydrogenated bisphenol A (dicyclohexanolpropane) is very suitable for the present invention for synthesizing the polyesters (A) and crosslinking agents (B) since its use produces good blocking resistance of the materials coupled with relatively low melt viscosity. It is also possible to introduce amide and imide structures. The introduction of such structures is known to the person skilled in the art, for example, from German Patents DE-A-15 700 273 and DE-A-17 200 323. Such polyester amides or polyester imides (A) may in many cases meet

particular requirements, in respect of thermal stability, for example, better than do straight polyesters (A).

The introduction of the structural units in accordance with the formulae I and II may take place preferably through the use of acidic esters in accordance with the formulae III to VI during the product condensation. Oligo-DCPD mixtures may be obtained in a manner known per se by polycycloaddition of cyclopentadiene under pressure at temperatures between 170 and 300°C. The reaction products may subsequently be worked up by distillation or reacted directly, with maleic anhydride and water, for example, to the compounds of the formulae V and VI. A further possibility is to prepare polyesters (A) with an excess of acid and then to react them with DCPD. A high conversion requires the use of catalysts, such as boron trifluoride etherate. At higher temperatures and pressure, oligo-DCPD structures are also formed.

Where the polyesters (A) contain double bonds in the polymer chain, as maleic or fumaric esters, for example, grafting with cyclopentadiene produces endomethylenetetrahydrophthalic acid structures in accordance with the formula VIII:



### (VIII).

For the particular use intended, specific requirements in respect of hardness, elasticity, viscosity, softening point or the like may be imposed on the polyesters (A) from which the hot-melt resins of the invention have been synthesized. In respect of

these particular requirements, the synthesis of the polyesters (A) then takes place in accordance with rules known per se to the person skilled in the art. For instance, the (partial) crystallinity of the polyesters (A) and the elasticity of cured polyesters (A) are varied by the selection and the chain length of the polyols or polycarboxylic acids. For example, polyesters (A) synthesized using hexanediol or adipic acid are more flexible than those based on phthalic acid and ethylene glycol. Also known to the person skilled in the art is the control of the properties through the use of polyfunctional substances which produce branching in the polyester molecules, such as trimellitic acid or trimethylolpropane.

The amount of polyesters (A) for use in accordance with the invention in hot-melt resins of the invention may vary widely. In this way it is further possible to tailor the profile of properties of the hot-melt resins of the invention to the particular end use, in a simple and advantageous manner. In accordance with the invention it is of advantage if the polyesters (A) are present in the hot-melt resins of the invention in an amount, based in each case on the hot-melt resins, of from 5 to 90% by weight, preferably from 7 to 85% by weight, with particular preference from 9 to 80% by weight, and in particular from 11 to 75% by weight.

The hot-melt resins of the invention may further comprise customary and known additives in effective amounts. Examples of suitable additives are curing accelerators, photoinitiators, pigments and/or fillers.

Examples of suitable curing accelerators are compounds which form free radicals on heating. Examples of known free-radical formers are peroxides, azo compounds, azides and C-C-labile substances, as described in German Patent DE-A-26 32 294. A considerable acceleration of the curing, or reduction

in curing temperature, is obtainable with metal  
coinitiators such as compounds of cobalt, manganese,  
iron, nickel or lead.

Examples of suitable pigments and/or fillers are examples of suitable inorganic color pigments (D) 20 are titanium dioxide, iron oxides, Sicotrans yellow and carbon black. Examples of suitable organic color pigments are indanthrene blue, Cromophthal red, Irgazine orange and Heliogen green.

Further examples of suitable additives are described in the text book "Lackadditive" [Coatings





by dipping, hot-dipping, dip-rolling, flooding, casting, vacuum impregnation, vacuum pressure impregnation or trickling onto and into the optionally preheated components, especially the electronic  
 5 components, onto and into the optionally preheated absorbent substances, especially the glass silk or mica tapes, or to the primed or unprimed substrates to be coated, especially the vehicle body parts provided with an electrodeposition coating, or the packaging, or the  
 10 plastics parts provided with a water-based primer.

Also possible is an application in the manner of polymer injection molding, in which case the component to be insulated is implemented in the injection mold. Thus it is possible, for example, to  
 15 mass-produce small parts rapidly.

Melting may take place, for example, in the course of flow through a heat exchanger. Preference is given to combinations of melting devices and integrated and/or downstream mechanical conveyance, e.g. metering  
 20 melt screw devices (extruders).

The applied hot-melt resins may be partly gelled before actual curing. This has the advantage that dripping losses can be avoided.

In accordance with the invention, the resins  
 25 are cured by thermal curing by means of electricity, induction, hot fluids, especially hot inert gases, microwave radiation and/or IR radiation, especially near infrared (NIR) radiation. Particular advantages result from the use of IR radiation and especially NIR  
 30 (approximately 700 - 1300 nm). It is also possible to use any desired combination and sequence of the abovementioned methods for curing.

In accordance with the invention, the hot-melt resins of the invention may also be cured with actinic  
 35 radiation. Suitable actinic radiation includes electromagnetic radiation and/or corpuscular radiation. UV light (electromagnetic radiation) and/or electron

- 19 -

beams (corpuscular radiation) are particularly suitable.

In accordance with the invention it is before part to combine the two curing methods with one  
5 another.

For example, the applied hot-melt resins of the invention may first be surface-cured with UV light and then cured to completion, with heating, using compounds which on heating produce free radicals.

10 In the field of electrical insulation, curing takes place by exposure to high-energy radiation, preferably UV light, or by means of heat, preferably oven heating and/or IR heating, especially by NIR. With particular preference, combined curing with UV light  
15 and/or NIR and heat is employed. A technical advantage of the hot-melt resins of the invention in this respect is their high UV and heat reactivity at comparatively low temperatures of below 180°C, preferably below 140°C. This is in association with good melt stability  
20 at temperatures only slightly below the reaction temperature. This ensures that the hot-melt resins can be prepared and applied from the melt without premature reaction and without the electrical components being destroyed by high temperatures during the curing of  
25 their insulating compositions. Moreover, the electronic components may be produced rapidly in rational mass production, since curing is rapid. These advantages also result in the context of the use of the hot-melt resins of the invention in the other above-described  
30 technological fields.

Also of very particular importance is the use of NIR, since it penetrates deep into the applied hot-melt resins of the invention and thus brings about rapid and uniform heating with only a small temperature  
35 difference over the thickness of the coat, and so permits the curing even of thick coats without heating the component, the absorbent material or the substrate as a whole. Longwave IR radiation is absorbed

- 20 -

substantially at the surface, with in-depth heating being possible only by way of slow heat flux; in other words, a large temperature difference is produced with the consequence of non-uniform curing over the

5 thickness of the coat.

The abovementioned curing processes may also be performed until a B stage, i.e. a part-cured stage is reached. Subsequently, curing is interrupted and can be recommenced at a later point.

10 A curing process which is especially advantageous for electrical insulating hot-melt resins consists in first carrying out surface curing with UV light and then carrying out further curing, with heating, using substances which on heating produce free  
15 radicals. If the hot-melt resins of the invention are to be used as casting and impregnating compositions, i.e. for preparing insulating compositions in electrical windings, the insulating composition in the interior of the electronic components is first of all  
20 cured in whole or in part by means of Joule heat. Subsequently, a surface which may have cured poorly is aftercured or postcrosslinked with IR radiation, preferably NIR radiation and/or UV light, the insulating composition in the interior of the windings  
25 also being crosslinked further, possibly, by means of heat.

A further end use for the hot-melt resins of the invention is in the insulation and protection against mechanical abrasion of, for example, the winding head of hi-speed DIY power tools. For this purpose, the already insulated windings, heated very highly by means of Joule heat, are subjected to resin powder in a fluidized bed, for example, in the course of which a resin coat that can be determined by means of the preheating is sintered on, and crosslinked.

The articles of the invention that are impregnated or coated with the cured hot-melt resins of the invention have a much longer surface life than

conventional components, insulating materials and substrates and have a more advantageous profile of properties, so making them more valuable - from an economic standpoint, too - for the user. For instance, the components of the invention, especially the electronic components of the invention, are superior to the conventional components in respect, inter alia, of freedom from tack, freedom from cracks, hardness and abrasion resistance, for example. The insulating materials of the invention have a greater weathering stability and are therefore suitable inter alia for applications under extreme climatic conditions (maritime, tropical or polar climate). The same applies to the substrates of the invention, especially the vehicle body parts, packaging or industrial components of the invention such as wheel rims, radiators or runners subject to particular heat, moisture and/or radiation stresses.

## 20 **Examples**

### **Preparation Example 1**

**The preparation of the compound 1 (monocarboxylic acid of formula V)**

710.81 g of 93% dicyclopentadiene (5.0 mol)  
25 490.30 g of maleic anhydride (5.0 mol)  
are weighed out into a stirring flask with heating and reflux condenser. The mixture is heated to 125°C under a gentle stream of nitrogen and then  
95.00 g of water 5.0 mol + 5 g (5.0 mol + 5 g)  
30 are added from a dropping funnel over the course of one hour. The mixture is left to react at 125°C for one hour. A monocarboxylic acid of formula V is formed.

### **Preparation Example 2**

35 **The preparation of the unsaturated polyester (A)**

1344.00 g of dicyclohexanolpropane  
1033.60 g of compound 1 from Preparation Example 1  
235.20 g of maleic anhydride

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278.40 g of fumaric acid  
 630.00 g of Polyol TP 70 (1 mol trimethylolpropane  
 + 7 mol ethylene oxide)  
 34.00 g of hypophosphorous acid, 50% strength  
 5 (esterification catalyst)  
 0.50 g of hydroquinone  
 are weighed out into a stirring flask with heating and  
 top-mounted distillation unit. The mixture is heated  
 rapidly to 130°C under a gentle stream of nitrogen.  
 10 Then the temperature is raised gradually to 190°C over  
 the course of 4 1/2 hours, during which the water of  
 condensation which forms is removed by distillation.  
 Then a vacuum is applied and the temperature is held at  
 190°C for three hours more. This gives a resin melt  
 15 which is cast onto aluminum foil and solidifies to give  
 a hard, blocking-resistant resin. The resin has an acid  
 number of 14.7 and melt viscosities of 158 Pas/120°C;  
 73 Pas/130°C; 46 Pas/140°C.

### 20 **Preparation Example 3**

**The preparation of a polyester-based crosslinking agent  
 (B) terminated with isoprenol ester**

1753.7 g of adipic acid (6.0 mol)  
 478.6 g of isoprenol (5.5 mol)  
 25 368.4 g of dicyclohexanolpropane (2 mol)  
 261.7 g of THEIC (trishydroxyethyl isocyanurate)  
 (1 mol)  
 400.0 g of toluene  
 6.0 g of Fascat 4201 (tin catalyst)  
 30 (0.5 equivalent HO excess) are weighed out into a  
 stirring vessel with heating and water separator. The  
 mixture is heated rapidly to 130°C under a gentle  
 stream of nitrogen. Water is then separated off with  
 vigorous boiling. After about 3 hours, the formation of  
 35 water subsides. Then the temperature is raised  
 gradually to 190°C over the course of approximately 2  
 hours, during which the toluene unreacted isoprenol and  
 some additional water are removed by distillation. Then

a vacuum is applied and condensation is continued at 190°C for 4 hours.

5 This gives a resin melt which is passed onto aluminum foil and solidifies to give a hard, blocking-resistant resin. The resin has an acid number of 17.2 and melt viscosities of 6.28 Pas/120°C; 4.71 Pas/130°C; 2.21 Pas/140°C.

10 **Preparation Example 4**

**The preparation of a polyurethane-based crosslinking agent (B) terminated with acrylic ester/isoprenyl**

296.3 g of hexanediol (2.5 mol)

4064.2 g of hydroxyethyl acrylate (2.5 mol)

15 1033.6 g of isoprenol (3.5 mol)

1504.8 g of MDI (5.5 mol)

The hydroxyl components are charged to a stirring flask and at approximately 70°C MDI is added over 30 minutes with stirring, during which the temperature is raised  
20 to 120°C; it is held at 120°C for a further 20 minutes and then the resultant melt is cast onto aluminum foil. After cooling, a hard, blocking-resistant resin is obtained.

The resin has a melt viscosities of 2.16 Pas/120°C;  
25 1.97 Pas/130°C; 0.94 Pas/140°C.

**Example 1**

**The preparation of a hot-melt resin of the invention**

680 g of the polyester resin (A) from Preparation  
30 Example 2

320 g of the crosslinking agent (B) from Preparation Example 3

30 g of dicumylperoxide (DCPO)

10 g of Härter BK (benzpinacol curing agent, BAYER)

35 3 g of hydroquinone monomethyl ether

10 g of benzophenone

25 g of benzoin

are mixed in a hammer mill, ground and homogenized at 94°C in a laboratory extruder, with a residence time of 6 minutes. The discharge from the extruder is collected on sheet aluminum and after cooling is ground.

5

## **Example 2**

### **The preparation of a hot-melt resin of the invention**

The procedure of Example 2 is repeated except that the crosslinking agent (B) from Preparation 10 Example 4 is used rather than the crosslinking agent (B) from Preparation Example 3.

## **Example 3**

### **The testing of the hot-melt resins of Examples 2 and 3 for melt behavior and reactivity (gel time)**

Samples of the hot-melt resins of Examples 2 and 3 are melted in the plate/plate measuring apparatus of a programmable rheometer (from Physica) at approximately 90°C under oscillating shear, the 20 temperature is then raised to 105°C, and the time is measured at which the resin gels, i.e. the viscosity curve rapidly rises very steeply (gel time). With a further sample, starting at 100°C, a heating rate of 10 K/min is applied and the temperature is measured at 25 which the resin gels (onset temperature).

The results of the measurement are given in the table.

30 **Table: Melting behavior and reactivity of the hot-melt resins of the invention from Examples 2 and 3**

Example	Gel time [min]	Onset temperature [°C]
2	122	142
3	67	128

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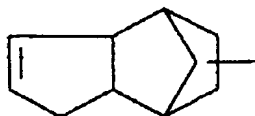
To test the hot-melt resins of the invention from Examples 2 and 3 for their curing behavior, samples of the resin powders 2 and 3 were weighed out



into deep metal lids in an amount such that the thickness after melting was 10 mm. The powder-filled metal lids are subjected to melting in an oven at 105°C for 10 minutes to give substantially bubble-free resins 2 and 3. The metal lids containing the melts 2 and 3 are then irradiated on a plate preheated to 110°C under a mercury vapor lamp with an energy of 14 mJ/cm<sup>2</sup> for 5 minutes, forming an almost tack-free skin on the resin surface. After irradiation, the metal lids are subjected to curing in the oven at 140°C in 20 minutes. This gives hard, crack-free resin blocks 2 and 3. The mass losses in the course of the curing process are < 1% for both resins.

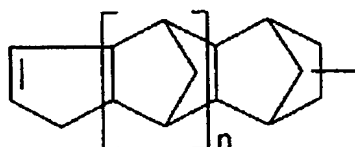
**Hot-melt resins and their use****Claims**

1. Hot-melt resins comprising
  - A) at least one solid unsaturated polyester and
  - B) at least one oligomeric and/or polymeric crosslinking agent which is copolymerizable with the said polyester and which in respect of the oligomeric and/or polymeric main chain comprises at least one terminal and/or pendant propenyl, isopropenyl and/or (meth)acrylic ester group.
2. The hot-melt resins as claimed in claim 1, characterized in that the crosslinking agents (B) have at least two terminal and/or pendant propenyl, isopropenyl and/or (meth)acrylic ester groups.
3. The hot-melt resins as claimed in claim 1 or 2, characterized in that the crosslinking agents (B) have propenyl and/or isopropenyl groups.
4. The hot-melt resins as claimed in one of claims 1 to 3, characterized in that the oligomer and polymer main chains are formed by saturated and/or unsaturated polyesters, polyester amides, polyester imides and/or polyurethanes.
5. The hot-melt resins as claimed in one of claims 1 to 4, characterized in that at least one of the unsaturated polyesters (A) and/or at least one of the crosslinking agents (B) has at least one structural unit of the general formula I

**(I)**

- 27 -

and/or at least one structural unit of the general formula II



(II) in which the index  $n$  is an integer from 1 to 10.

6. The hot-melt resins as claimed in one of claims 1 to 5, characterized in that they comprise additives, especially curing accelerators, photoinitiators, especially of Norrish type 1 or 2, pigments and/or fillers.

7. The hot-melt resins as claimed in claim 6, characterized in that the photoinitiators are bonded chemically to at least one of the unsaturated polyesters (A) and/or at least one of the crosslinking agents (B).

8. The use of the hot-melt resins as claimed in one of claims 1 to 7 as casting and impregnating compositions or coating materials.

9. The use of the hot-melt resins as claimed in claim 8, characterized in that they are used as casting and impregnating compositions for components and for impregnating absorbent materials and also as coating materials for primed and unprimed substrates.

10. The use of the hot-melt resins as claimed in claim 9, characterized in that the components comprise electronic components, the absorbent materials comprise sheetlike insulating materials, especially glass silk and mica tapes, and the primed and unprimed substrates comprise vehicle body parts, industrial components or packaging, especially of metal and/or plastic.

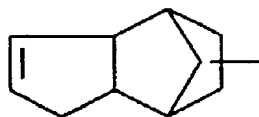
11. A process for the melt impregnation or melt coating of components, absorbent materials or primed and unprimed substrates by

- (i) melt-applying a hot-melt resin,
- (ii) applying the resultant resin melt onto and into the components, absorbent materials or primed or unprimed substrates,
- (iii) curing the applied resin melt by heat and/or actinic radiation,

A) at least one solid unsaturated polyester and

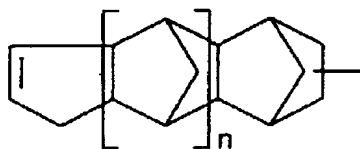
12. The process as claimed in claim 12, characterized in that the crosslinking agents (B) have at least two terminal and/or pendant propenyl, isopropenyl and/or (meth)acrylic ester groups.

14. The process as claimed in one of claims 11 to 13, characterized in that the oligomer and polymer main chains are formed by linear, branched and/or dendrimeric, saturated and/or unsaturated polyesters, polyester amides, polyester imides and/or polyurethanes.



(I)

and/or at least one structural unit of the general formula II



(II) in which the index n is an integer from 1 to 10.

16. The process as claimed in one of claims 11 to 15, characterized in that they comprise additives, especially curing accelerators, photoinitiators, especially of Norrish type 1 or 2, pigments and/or fillers.

17. The process as claimed in claim 16, characterized in that the photoinitiators are bonded chemically to at least one of the unsaturated polyesters (A) and/or at least one of the crosslinking agents (B).

18. The process as claimed in one of claims 11 to 17, characterized in that the application (ii) takes place by

- placing at least one shaped part comprising the hot-melt resin and adapted in its shape to the shape of the component, absorbent material or primed and unprimed substrate to be coated onto the component, absorbent material or primed and unprimed substrate, and melting the shaped part,
- or by

- dipping, hot-dipping, dip-rolling, flooding, casting, vacuum impregnation, vacuum pressure impregnation or trickling.

19. The process as claimed in one of claims 11 to 18, characterized in that the applied hot-melt resin is partially gelled (process step iv) before process step (iii).

20. The process as claimed in one of claims 11 to 19, characterized in that the applied hot-melt resin in process step (iii) is cured by thermal curing by means of electricity, induction, hot fluids, especially hot gases, microwave radiation and/or IR radiation, especially near infrared (NIR) radiation.

21. The process as claimed in one of claims 11 to 20, characterized in that the applied hot-melt resin in process step (iii) is cured electromagnetic radiation, especially UV radiation, and/or corpuscular radiation, especially electron beams.

22. Components, especially electrical components, sheetlike insulating materials based on absorbent materials, and primed and unprimed substrates comprising at least one hot-melt resin, cured thermally and/or with actinic radiation, as claimed in one of claims 1 to 10.

23. The components, especially the electronic components, the sheetlike insulating materials based on absorbent materials and the primed and unprimed substrates as claimed in claim 22, characterized in that the hot-melt resins have been applied and cured with the aid of the process as claimed in one of claims 11 to 21.

**ABSTRACT**

The invention relates to cast resins containing A) at least one solid unsaturated polyester and B) at least one oligomer and/or polymer cross-linking agent that can be copolymerised therewith, said cross-linking agent having at least one terminal and/or lateral  
5 propenyl-, isoprenyl- and/or (meth)acrylester group in relation to the oligomer- and/or polymer main chain. The invention also relates to the use of cast resins as casting beans and impregnants and as coating agents. The invention further relates to a method for melt impregnating or melt coating components, absorbent mattes or grounded or ungrounded substrates with the cast resins.

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the specification of which (CHECK applicable BOX(ES))  
X ☐ A. ☐ is attached hereto.  
BOX(ES) → B. ☒ was filed on February 21, 2002 as U.S. Application No. 10/069,020  
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PRIOR FOREIGN APPLICATION(S)

Number	Country	Date first Laid-open or Published	Date Patented or Granted	Priority NOT Claimed
19939759.7	DE	21/Aug/1999		

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And I hereby appoint Pillsbury Winthrop LLP, Intellectual Property Group, telephone number (703) 905-2000 (to whom all communications are to be directed), and persons of that firm who are associated with USPTO Customer No. 909 (see below label) individually and collectively my attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith and with the resulting patent, and I hereby authorize them to delete from that Customer No. names of persons no longer with their firm, to add new persons of their firm to that Customer No., and to act and rely on instructions from and communicate directly with the person/assignee/attorney/firm/ organization who/which first sends/sent this case to them and by whom/which I hereby declare that I have consented after full disclosure to be represented unless/until I instruct the above firm and/or an attorney of that firm in writing to the contrary

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00909

(1) INVENTOR'S SIGNATURE: *Rainer Blum*

Date: *22.09.2002*

Name	Rainer	BLUM
First	Middle Initial	Family Name
Residence	Ludwigshafen	Federal Republic of Germany
City	State/Foreign Country	Country of Citizenship
Mailing Address	Rudigerstrasse 64, Ludwigshafen, Federal Republic of Germany	
(include Zip Code)	D-67069	

(2) INVENTOR'S SIGNATURE:

Date:

Name	Manfred	EICHHORST
First	Middle Initial	Family Name
Residence	Oststeinbek	Federal Republic of Germany
City	State/Foreign Country	Country of Citizenship
Mailing Address	Am Ohlendiek 18, Oststeinbek, Federal Republic of Germany	
(include Zip Code)	D-22113	

☒ FOR ADDITIONAL INVENTORS see attached page.

☐ See additional foreign priorities on attached page (incorporated herein by reference).

Atty. Dkt. No. P290586  
(M#)



## DECLARATION AND POWER OF ATTORNEY

(continued)

## ADDITIONAL INVENTORS

(3) INVENTOR'S SIGNATURE:

Date:

Gunther		HEGEMANN	
First	Middle Initial	Family Name	
Residence	Hamburg	Federal Republic of Germany	Germany
City	State/Foreign Country		Country of Citizenship
Post Office Address	Andreasstr. 23, Hamburg, Federal Republic of Germany		
(include Zip Code)	D-22301		

(4) INVENTOR'S SIGNATURE:

Date:

Klaus-Wilhelm		LIENERT	
First	Middle Initial	Family Name	
Residence	Hamburg	Federal Republic of Germany	Germany
City	State/Foreign Country		Country of Citizenship
Post Office Address	Bernadottestr. 54, Hamburg, Federal Republic of Germany		
(include Zip Code)	D-22763		

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00909

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Date:

Name	Rainer	BLUM
First	Middle Initial	Family Name
Residence	Ludwigshafen	Federal Republic of Germany
City	State/Foreign Country	Country of Citizenship
Mailing Address	Rudigerstrasse 64, Ludwigshafen, Federal Republic of Germany	
(include Zip Code)	D-67069	

(2) INVENTOR'S SIGNATURE:

Date:

Name	Manfred	EICHHORST
First	Middle Initial	Family Name
Residence	Oststeinbek	Federal Republic of Germany
City	State/Foreign Country	Country of Citizenship
Mailing Address	Am Ohlendiek 18, Oststeinbek, Federal Republic of Germany	
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Atty. Dkt. No. P290586  
(M#)

## DECLARATION AND POWER OF ATTORNEY

(continued)

## ADDITIONAL INVENTORS

(3) INVENTOR'S SIGNATURE:

Date:

Gunther		HEGEMANN	
First	Middle Initial	Family Name	
Residence	Hamburg	Federal Republic of Germany	Germany
City	State/Foreign Country		Country of Citizenship
Post Office Address	Andreasstr. 23, Hamburg, Federal Republic of Germany		
(include Zip Code)	D-22301		

(4) INVENTOR'S SIGNATURE:

Date:

Klaus-Wilhelm		LIENERT	
First	Middle Initial	Family Name	
Residence	Hamburg	Federal Republic of Germany	Germany
City	State/Foreign Country		Country of Citizenship
Post Office Address	Bernadottestr. 54, Hamburg, Federal Republic of Germany		
(include Zip Code)	D-22763		

(5) INVENTOR'S SIGNATURE:

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## ADDITIONAL INVENTORS

(3) INVENTOR'S SIGNATURE:

Date:

26.04.2002

Gunther		HEGEMANN	
First	Middle Initial	Family Name	
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19939759.7	DE	21/Aug/1999			

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Date:

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First	Middle Initial	Family Name
Residence	Ludwigshafen	Federal Republic of Germany
City	State/Foreign Country	Country of Citizenship
Mailing Address	Rudigerstrasse 64, Ludwigshafen, Federal Republic of Germany	
(include Zip Code)	D-67069	

**(2) INVENTOR'S SIGNATURE:**

Date:

Name	Manfred	EICHHORST
First	Middle Initial	Family Name
Residence	Oststeinbek	Federal Republic of Germany
City	State/Foreign Country	Country of Citizenship
Mailing Address	Am Ohlendiek 18, Oststeinbek, Federal Republic of Germany	
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Atty. Dkt. No. P290586

(M#)

**DECLARATION AND POWER OF ATTORNEY**  
(continued)  
**ADDITIONAL INVENTORS**

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First	Middle Initial	Family Name	
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